Winning Strategy for "First to 100" Game

Yes, there is a winning strategy for the "first to 100" game. Here's the idea:

1. To ensure victory, aim to reach specific "target numbers" on each of your turns. The key target number is **89**, because if you reach 89 on your turn, no matter what number your opponent adds (from 1 to 10), you can always reach 100 on your next turn.
2. To reach 89 as a target, you should aim to reach earlier "target numbers" that force your opponent toward 89. These numbers are 78, 67, 56, 45, 34, 23, 12, and 1.
3. If you start the game, add **1** on your first turn to reach the sum of 1, and then keep aiming for each of the target numbers above. For example, if you reach 1, no matter what number your opponent adds (between 1 and 10), you can always adjust your next move to reach the next target number (12, then 23, and so on), eventually reaching 89 and winning on your next turn.

If you go second and your friend starts optimally with 1, they can follow this strategy and guarantee their win.

Trailing Zeros in $1000!$

To find the number of trailing zeros in $1000!$, count the factors of 5 in the numbers from 1 to 1000, because each factor of 5 paired with a factor of 2 gives a trailing zero.

1. Count multiples of 5: $\left\lfloor \frac{1000}{5} \right\rfloor = 200$
2. Count multiples of $5^2 = 25$: $\left\lfloor \frac{1000}{25} \right\rfloor = 40$
3. Count multiples of $5^3 = 125$: $\left\lfloor \frac{1000}{125} \right\rfloor = 8$
4. Count multiples of $5^4 = 625$: $\left\lfloor \frac{1000}{625} \right\rfloor = 1$

Adding these up:

$$200 + 40 + 8 + 1 = 249$$